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value more weighty than suggestiveness. It may very well be questioned whether the measurements have not been pushed to more complicated processes than can yet be approached with advantage.

E. C. S.

*Ueber den Einfluss der Uebung auf geistige Vorgänge.* Dr. G. O. BERGER.  
Wundt's Philos. Stud. V. 1. 1888.

The influence of practice was measured by its effect on the rapidity with which gymnasium pupils of different classes, and those of the highest class of a preparatory school, could pronounce Latin and German. The best five and the worst five in each of the classes were taken for the trial; the average age in the class from the preparatory school was 9; in the highest gymnasium class, 21.6. The test consisted in reading with the greatest rapidity first 100, then 500 words, and third, the first 100 words again at the normal rate. The Latin read was from Tacitus's *Agricola*; the German, from Goethe's *Egmont*. The improvement in the rate through the ten classes follows what may be assumed as the general law of the effect of practice, namely, a rather rapid quickening at first, followed by less and less gain as practice continues. The time for 100 words in the preparatory class, which had not as yet studied Latin, was 262 seconds; for the gymnasium classes respectively, 135, 100, 84, 79, 57, 54, 49, 48, 43. For German the times were 72, 55, 43, 37, 39, 28, 27, 26, 25, 23. The 100-word rate in Latin is 7 per cent shorter than that which can be kept up for 500 words; in German, but 3 per cent. The "normal reading" in the lower classes was a little quicker than the first reading because the words were a little familiar. The higher classes took longer for the second reading than for the first because they read for the sense. To set aside the possible objection that the increased speed was an evidence of increased mental quickness, and not the result of familiarity with the language, the gymnasium pupils were shown sets of five and of ten colors, and the time required to recognize and name them measured. The rates do not increase regularly with the increase in age, as they should do if the objection were valid. Granting the increased rapidity by practice, the question follows as to how practice has made the change. The gain appears to be chiefly in the overlapping of processes, as in Cattell's experiments (noted in the *JOURNAL*, I, p. 709), and in the size of the groups of words grasped at a time. The children in the preparatory school, for example, read Latin by syllables; those a little more advanced, by words; the highest, by phrases, as is testified by the kinds of errors made in reading at full speed, and by the less proportionate advantage shown by the boys of the higher classes in reading disconnected words.

*Ueber die Reactionszeit für Erregung und für Hemmung.* GAD, nach Versuchen des Herrn Dr. Orschansky. Verhandlungen der Physiol. Gesells. zu Berlin, No. 13-14, June 4, 1887.

The muscle selected for these experiments was the masseter, because its relaxation is not attended by the contraction of an antagonist. Its contractions and relaxations, by means of which the reaction times for excitation and inhibition were measured, were recorded by a double-branched apparatus, one branch of which entered the mouth on each side and pressed against the muscle,

while a forward pair were adapted to recording with a Marey's drum. For comparison, the motions of the lower jaw under the action of antagonistic muscles were also experimented upon. The rhythm of most rapid contraction and relaxation proved at first slower in the masseter than in the others, but practice equalized the rate, though it seems to be effective only in shortening the stage of contraction. Such experiments, however, are not suited to determine the real reaction time for inhibition. When that was measured directly by reacting with relaxation to an electric shock, the inhibition time was found to be the same as that for excitation, and the equality continued through variations of the intensity of the shock, fatigue, alcohol dosing, etc. The simple reaction time for the jaw motions was, closing 0.15 s., opening 0.17 s.; for the masseter, contraction, before practice 0.25 s., after practice 0.15 s.; relaxation, before practice 0.30 s., after practice 0.14 s. Interesting experiments were also made on the variations introduced by the strength of the spring that pressed the arms of the apparatus against the muscle. If the subject intended to cause a slight motion and the spring was stiff, the reaction time was decreased; if under the same circumstances he intended to make a considerable motion, the time was lengthened.

*Ueber Wiedererkennen. Versuch einer experimentellen Bestätigung der Theorie der Vorstellungsassoziationen.* ALFRED LEHMANN, Ph. D. Philos. Studien, Bd. V (1888), H. I, pp. 96-156.

Can all the phenomena of association be explained by the law of *contiguity*? This is the problem that Dr. Lehmann attempts to solve. From the standpoint of association by contiguity, recognition of simple impressions is possible, in the author's opinion, only under two conditions: first, that the memory-picture of a former sensation still exists, with which the later sensation may be compared; or, second, that a name or the like has been associated with the sense impression. The latter is not strictly recognition, but is so called. Dr. Lehmann's experiments, performed with sensations of light, cover both cases.

In the investigation of the first case, the different shades of gray, produced by means of rotating disks partly black and partly white, were employed. The disks were shown by means of a carefully prepared apparatus, in the following manner. First, a disk of normal shade was shown. After the lapse of an interval the normal disk was again shown; or a disk of lighter shade, or one of darker shade appeared. The observer judged whether the disk last shown was like or unlike the former one. In the first set of experiments only two disks were used. The interval was 30 sec. The normal disk was half black and half white, *i. e.* it =  $180^\circ$  black +  $180^\circ$  white. The other disk varied between  $240^\circ$  white +  $120^\circ$  black and  $188^\circ$  white +  $172^\circ$  black. Under these conditions, as the amount of white in the disks decreased, the average number of correct answers in each series of 30 experiments fell from 29 to 18 with one observer, from 27 to 17 with the other; the number of correct answers likely to occur by chance being of course 15. Thus as the difference between the normal disk and the light disk decreases, the number of correct answers diminishes. In another set of similar experiments three disks were used; and the light disk was always as many